1   <u>SYSTEM AND METHOD FOR CALL CENTER DIALOG MANAGEMENT</u>

2

3   <u>BACKGROUND OF THE INVENTION</u>

4   1.   <u>Field of the Invention</u>

5   The present invention relates generally to systems and methods for call

6 management, and more particularly to varying a call center dialog property.

7   2.   <u>Discussion of Background Art</u>

8   Call centers are increasingly used to manage calls to and from a variety of

9 entities and in a variety of applications. Some entities (i.e. contacts) include, existing

10 customers, potential customers, suppliers, and vendors. Some call center applications

11 include, providing movie theatre listings and driving directions, automated banking,

12 and product marketing.

13   Such systems often use Interactive Voice Response (IVR) software as a first

14 step in processing an incoming call before connecting the contact with a human

15 operator. The IVR software tends to improve the call center's efficiency and reduce a

16 number of human operators required to handle the contacts.

17   In a typical dialog between the IVR software and the contact, the IVR software

18 presents the contact with either information or a question. The contact listens to the

19 information or question, and then responds in some way, either by requesting more

20 information or answering the question. The IVR system's portion of the dialog

21 typically consists of either prerecorded messages or synthesized text generated by a

22 Text-To-Speech (TTS) algorithm.

23   However, while the actual information presented to the contact can greatly

24 vary depending upon the outcome of such questions and answers, how that

25 information is presented to the contact tends to have a fixed set of properties which

26 are set when the IVR system's software is first compiled. Such rigid properties often

1   present the IVR system's dialog in a wooden, awkward, inefficient, and hard to

2   understand way, so much so that contacts often become confused and or frustrated

3   with the dialog, resulting in either a lost sale, or premature connection to a human

4   operator.

5   So while an IVR system designer might be able to modify how the IVR system

6   presents the dialog before an IVR system's source code is compiled, present call

7   center IVR systems do not give contacts control in how the IVR system's dialogs are

8   presented during execution the IVR system's object code.

9   In response to the concerns discussed above, what is needed is a system and

10   method for call management that overcomes the problems of the prior art.

11

1   # SUMMARY OF THE INVENTION

2   The present invention is a system and method for call center dialog

3   management. The method of the present invention includes: presenting a contact with

4   a first call center dialog segment having a current call center dialog property;

5   receiving from the contact a contact dialog segment; identifying a dialog property

6   keyword within the contact dialog segment; replacing the current call center dialog

7   property with a new call center dialog property in response to the dialog property

8   keyword; and presenting a second call center dialog segment having the new call

9   center dialog property to the contact. The system of the present invention, includes all

10   means for implementing the method.

11   These and other aspects of the invention will be recognized by those skilled in

12   the art upon review of the detailed description, drawings, and claims set forth below.

13

1 <u>BRIEF DESCRIPTION OF THE DRAWINGS</u>

2   Figure 1 is a dataflow diagram of one embodiment of a system for call center

3 dialog management;

4   Figure 2 is a flowchart of one embodiment of a root method for call center

5 dialog management; and

6   Figure 3 is a flowchart of one expanded embodiment of the root method for

7 call center dialog management.

8

1   DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

2   The present invention enables the properties of a dialog between a contact and

3   a call center to be varied in real-time as the call center and contact interact. For

4   example, a dialog's speed property can be adjusted based on the call center's analysis

5   of how the dialog is proceeding, or manually adjusted by a party in contact with the

6   call center, based on that contact's needs and preferences. Such flexibility greatly

7   improves a call center's responsiveness to contacts. For instance, contacts more

8   accustomed toward listening slowly, or contacts not fluent in the language of the

9   dialog can reduce the dialog's speed, while those contacts able to listen more quickly

10   and who are perhaps more familiar with the dialog's subject matter can increase the

11   dialog's speed.

12

13   Figure 1 is a dataflow diagram of one embodiment of a system 100 for call

14   center dialog management. A call center 102 enters into a dialog with a contact 104.

15   The dialog may have been initiated by the contact 104 who called the call center 102

16   (i.e. an incoming call), or by the call center 102 which called the contact 104 (i.e. an

17   outgoing call). Typical call centers include both computer systems and human

18   operators which interact with various contacts. Contacts are most often human, but in

19   some instances can include other non-human entities, such as a computer system.

20   The call center 102 presents a first call center dialog segment having a current

21   set of call center dialog properties to the contact 104. The call center 102 then

22   receives a contact dialog segment generated by the contact 104.

23   The subject matter of the call center's 102 dialog segments is dependent upon

24   information stored in both a dialog database 106 and a contact database 108. The

25   dialog database 106 contains dialog segments (i.e. messages and prompts) having

26   varying levels of specificity. Some of the dialog database's 106 messages may be

1   very generic, such as "Hello, you've reached ...", and are intended to be presented to

2   many if not most contacts. Other messages in the dialog database 106 may be very

3   specifically tailored toward a particular type of information being exchanged between

4   the call center 102 and the contact 104, such as "Your portfolio currently includes ...".

5   The contact database 106 associates each contact with a specific set of contact

6   attributes. Such attributes include: the contact's phone number and address, a

7   relationship status (such as whether the contact is a customer and etc.), a historical

8   record of the contact's 104 past and present dialogs with the call center 102, a set of

9   speech segments (i.e. recorded vocal utterances) and translated text 110, and many

10   other attributes known to those skilled in the art. These attributes may be populated

11   and supplemented from a variety of sources, including the call center's 102 own

12   dialog questions, publicly available phone directories, the internet, and customer

13   warranty cards.

14   The subject matter of the dialog depends upon the call center's 102 purpose

15   and the contact's 104 attributes. Thus, if the call center's purpose was to provide

16   contacts with financial information, then the contact 104 will be presented with a

17   dialog that first asks a series of generic security verification questions followed by a

18   more specific set of portfolio questions and prompts retrieved from the dialog

19   database 106. The contact 104 would then be presented with the contact's 104 own

20   portfolio information retrieved from the contact database 108.

21

22   A call manager 112 within the call center 102 activates an Interactive Voice

23   Response (IVR) module 114. The IVR module 114 translates the contact's 104 vocal

24   utterances and telephone tones into a form which the call center can understand using

25   either Natural Language Processing (NLP) algorithms, Automated Speech

26   Recognition (ASR) algorithms, or Voice Extensible Markup Language (Voice-XML)

1 interpreters. The IVR module 114 also translates the call center's dialog segments, in

2 accordance with the current call center dialog properties, into an audible form which

3 the contact 104 can understand. The IVR module 114 draws upon either pre-recorded

4 dialog segments 116 stored in the dialog database 106, a Text-To-Speech (TTS)

5 module 118, or a digital signal processor module 120 in order to help present the call

6 center's dialog to the contact 104. The call manager 112 stores a historical record of

7 both the call center 102 and contact 104 dialog segments in the contact database 108.

8

9 Operating in parallel with the dialog between the contact 104 and the call

10 center 102 is a dialog analysis module 122. The dialog analysis module 122 identifies

11 a set of dialog property keywords from the various contact dialog segments within the

12 dialog.

13 Dialog property keywords related to the dialog's speed include, "faster" and

14 "slower". For example the contact 104 could say either "Speak faster", "Could you

15 please speak faster", "Faster please", "Slow down", "Could you please speak slowly",

16 or "Slower please" in order to request that the speed of the call center's 102 portion of

17 the dialog be either increased or decreased respectively. Thus each contact with the

18 call center 102 can individually control the speed of their own dialog with the call

19 center 102. Such explicit requests by the contact 104 for adjusting the speed of the

20 dialog are preferably understood by the call center 102 using the Voice-XML

21 interpreter within the IVR module 114. So that the contact 104 does not accidentally

22 invoke one of the keywords during the dialog, the actual keywords searched for by the

23 dialog analysis module 122 are selected to minimize any direct or phonetically

24 equivalent conflict between the keywords and the contact's 104 normal dialog with

25 the call center 102. For example, if the contact's 104 normal dialog with the call

1   center 102 is expected to include the word "faster", then "faster" would not be

2   selected as a keyword.

3   The dialog analysis module 122 replaces the current call center dialog

4   properties with a new set of call center dialog properties, in response to the identified

5   dialog property keywords. For instance, in the example above where the dialog

6   property keywords relate to a speed at which the call center's 102 dialog segments are

7   presented to the contact 104, the first call center dialog property differs from the

8   second call center dialog property by the speed with which the call center's 102 dialog

9   segments are to be presented to the contact 104. The speed may either be increased or

10   decreased as directed by the keyword.

11

12   In parallel with the functionality above, the dialog analysis module 122 also

13   executes an automated dialog property management routine which can modify the call

14   center's dialog properties as well, as is now discussed. The dialog analysis module

15   122 retrieves the contact's 104 attributes, speech segments, and translated text from

16   the contact database 108. The data retrieved includes the current dialog between the

17   contact 104 and the call center 102. The dialog analysis module 122 generates a set of

18   dialog metrics, representative of the current dialog between the contact 104 and the

19   call center 102, from the information retrieved.

20   The set of dialog metrics include: a contact dialog interpretation error rate,

21   indicative of how many times the contact 104 was asked to repeat the contact's 104

22   answer to a call center 102 question; a grammar error rate, indicative of how poor the

23   contact's 104 grammar is; and a contact help request rate, indicative of how often the

24   contact 102 requests access to the call center's 102 help directory. These metrics are

25   specific instances of a general dialog quality metric. Those skilled in the art will

26   recognize that other heuristics and metrics for determining how "well" the dialog

1 between the contact 104 and the call center 102 is proceeding and how "well" the

2 contact 104 is "handling" the dialog.

3   The dialog analysis module 122 compares the set of dialog metrics against a

4 first set of dialog metric thresholds. If the generated dialog metrics varies from the

5 first set of thresholds by a predetermined amount, the dialog analysis module 122

6 replaces the current call center dialog properties with a new set of call center dialog

7 properties. Automatic modification of the call center's dialog properties is intended to

8 bring the dialog metrics back within a permitted variation from the first set of

9 thresholds.

10   For example, if the contact dialog interpretation and grammar error rates

11 exceed a first set of error rate thresholds, indicating that the contact 104 is having

12 difficulty with the dialog, the dialog analysis module 122 can replace the call center's

13 current dialog speed with a new slower dialog speed. However, if the contact dialog

14 interpretation and grammar error rates fall below the first set of thresholds, indicating

15 that the contact 104 is actually doing quite well with the dialog, then the dialog

16 analysis module 122 can replace the call center's current dialog speed with a new

17 faster dialog speed, enabling the contact 104 to more quickly dialog with the call

18 center 102.

19   Since the dialog analysis module 122 contains two routines for modifying the

20 call center's 102 dialog properties (e.g. the dialog property keyword routine and the

21 automated dialog property management routine), the dialog analysis module 122

22 preferably uses the automated dialog property management routine only if the contact

23 104 has not invoked any of the keywords.

24

25   The dialog analysis module 122 transmits the new call center dialog properties

26 to a dialog property controller 124. The dialog property controller 124 replaces the

1   current set of call center dialog properties with the new set of dialog properties, using

2   one of several different techniques, three of which are now described.

3   The first technique relies on the pre-recorded dialog segments 116 stored in

4   the dialog database 106. The pre-recorded dialog segments 116 include a set of

5   digitized pre-recorded call center dialog segments. These segments are pre-recorded

6   by a person speaking the dialog segment, and then stored in the dialog database 106.

7   While various sub-sets of the dialog segments 116 contain the same substantive

8   information, they are recorded in a different form (i.e. with different dialog

9   properties). For instance, the dialog segment "Hello ..." can be recorded in several

10   different languages, while still substantively being "a greeting". Similarly, the dialog

11   segment "Hello ..." can be recorded at different speeds, one at a slow pace, one at a

12   moderate pace, and one at a fast pace. Thus, the dialog property controller 124

13   replaces a first pre-recorded call center dialog segment having the current set of

14   properties with a second pre-recorded dialog segment having the new set of

15   properties.

16   The second technique varies parameters within the text-to-speech module 118.

17   The text-to-speech module 118 translates written text within the dialog database 106

18   into audible sounds corresponding to the text which the contact 104 can understand.

19   The text-to-speech module 118 includes a synthesizer whose synthesized speech

20   parameters, such as pitch, duration, rate, etc., can be automatically varied. For

21   example, the speed of the dialog can be varied by adjusting the text-to-speech

22   module's 118 rate parameter. Dialog speed can be varied in a Voice-XML

23   implementation of this technique, by controlling a <prosody> tag inside the <dialog>

24   tag. The <prosody> tag controls a rate by which a dialog is played. When the

25   dialog's properties can be varied using the text-to-speech module 118, the dialog

26   property controller 124 can more finely tune the properties than by varying the pre-

1   recorded dialog segments of the first technique. Then the dialog property controller

2   124 adjusts a text-to-speech synthesizer so that subsequent call center dialog segments

3   are generated using the new set of properties instead of the current set of call center

4   dialog properties.

5   The third technique uses the digital signal processing module 120 to adjust

6   some of the dialog's properties. For example, dialog speed is varied by using the

7   digital signal processing module 120 to perform signal processing time-scale

8   modifications which can either speed-up or slow-down the dialog's speed. Several

9   digital signal processing filters are well known for this purpose. Then the dialog

10   property controller 124 adjusts a digital signal processor parameter so that subsequent

11   call center dialog segments are generated using the new set of properties instead of the

12   current set of call center dialog properties. Those skilled in the art will recognize that

13   other techniques for varying dialog properties are also possible.

14

15   The IVR module 114 presents subsequent call center dialog segments to the

16   contact 104 using the new call center dialog properties. Thus modifications to the call

17   center dialog properties are effected in a seamless way, while the dialog between the

18   contact 104 and the call center 102 occurs, and there is no need to either halt or

19   interrupt execution of the dialog or the call center's 102 software.

20

21   Figure 2 is a flowchart of one embodiment of a root method 200 for call center

22   dialog management. In step 202 of the root method 200 the contact 104 is presented

23   with a first call center dialog segment having a current call center dialog property. In

24   step 204, a contact dialog segment is received from the contact. In step 206,

25   determining from the contact dialog segment whether the current call center dialog

26   property should be changed. In step 208, the current call center dialog property is

1   replaced with a new call center dialog property in response to the determining step.

2   Then in step 210, a second call center dialog segment having the new call center

3   dialog property is presented to the contact. The root method 200 is discussed in

4   further detail with respect to Figure 3.

5

6   Figure 3 is a flowchart of one expanded embodiment of the root method 300

7   for call center dialog management. In step 301, a call center 102 enters into a dialog

8   with a contact 104. The dialog may have been initiated by the contact 104 who called

9   the call center 102 (i.e. an incoming call), or by the call center 102 which called the

10   contact 104 (i.e. an outgoing call).

11   In step 302, the call center 102 presents a first call center dialog segment

12   having a current set of call center dialog properties to the contact 104. In step 303, the

13   call center 102 receives a contact dialog segment generated by the contact 104.

14   In step 304, a call manager 112 within the call center 102 activates an

15   Interactive Voice Response (IVR) module 114. In step 306, the call manager 112

16   stores a historical record of both the call center 102 and contact 104 dialog segments

17   in the contact database 108.

18   Operating in parallel with the dialog between the contact 104 and the call

19   center 102 is a dialog analysis module 122. In step 308, the dialog analysis module

20   122 identifies a set of dialog property keywords from the various contact dialog

21   segments within the dialog.

22   In step 310, the dialog analysis module 122 replaces the current call center

23   dialog properties with a new set of call center dialog properties, in response to

24   identified the dialog property keywords. For instance, in the example above where the

25   dialog property keywords relate to a speed at which the call center's 102 dialog

26   segments are presented to the contact 104, the first call center dialog property differs

1   from the second call center dialog property by the speed with which the call center's

2   102 dialog segments are to be presented to the contact 104. The speed may either be

3   increased or decreased as directed by the keyword.

4

5   In parallel with steps 308 and 310 above, the dialog analysis module 122 also

6   executes an automated dialog property management routine which can modify the call

7   center's dialog properties as well, as is now discussed. In step 312, the dialog analysis

8   module 122 retrieves the contact's 104 attributes, speech segments, and translated text

9   from the contact database 108. In step 314, the dialog analysis module 122 generates

10 a set of dialog metrics, representative of the current dialog between the contact 104

11 and the call center 102, from the information retrieved in step 312.

12   In step 316, the dialog analysis module 122 compares the set of dialog metrics

13 against a first set of dialog metric thresholds.

14   In step 318, if the generated dialog metrics varies from the first set of

15 thresholds by a predetermined amount and no keywords have been identified, the

16 dialog analysis module 122 replaces the current call center dialog properties with a

17 new set of call center dialog properties.

18

19   In step 324, the dialog analysis module 122 transmits the new call center

20 dialog properties to a dialog property controller 124. In step 326, the dialog property

21 controller 124 replaces the current set of call center dialog properties with the new set

22 of dialog properties, using one of several different techniques, three of which are now

23 described. Using the first technique, in step 328, the dialog property controller 124

24 replaces a first pre-recorded call center dialog segment having the current set of

25 properties with a second pre-recorded dialog segment having the new set of

26 properties. Using the second technique, in step 330, the dialog property controller 124

1   adjusts a text-to-speech synthesizer so that subsequent call center dialog segments are

2   generated using the new set of properties instead of the current set of call center dialog

3   properties. Using the third technique, in step 332, the dialog property controller 124

4   adjusts a digital signal processor parameter so that subsequent call center dialog

5   segments are generated using the new set of properties instead of the current set of call

6   center dialog properties. Those skilled in the art will recognize that other techniques

7   for varying dialog properties are also possible.

8

9   Then in step 334, the IVR module 114 presents subsequent call center dialog

10   segments to the contact 104 using the new call center dialog properties.

11

12   Note, while the present invention has been discussed primarily with respect to

13   a dialog speed property, those skilled in the art will recognize that other dialog

14   properties, such as dialog language choice, how concise the call center's dialog

15   segments are (i.e. a contact expertise level where there can be novice, intermediate,

16   and expert level segments, whereby the expert level segments are presented to

17   knowledgeable contacts, while the novice level segments are presented to less skilled

18   contacts), how detailed the help messages presented to the contact are (i.e. a contact

19   help level), and many other properties can be dynamically varied as the system 100

20   executes as well.

21

22   While one or more embodiments of the present invention have been described,

23   those skilled in the art will recognize that various modifications may be made.

24   Variations upon and modifications to these embodiments are provided by the present

25   invention, which is limited only by the following claims.